

## CASE REPORT

# Rotational ablation assisted angioplasty of an obstructed aortopulmonary collateral artery

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## Abstract

**A 15 month old baby girl with pulmonary atresia, ventricular septal defect, and multiple aortopulmonary collateral arteries underwent rotational ablation assisted balloon angioplasty of a severely stenosed collateral artery that had previously proved undilatable using a high pressure non-compliant balloon angioplasty catheter. It is postulated that the rotablation debulked a fibrotic stricture within the artery to facilitate effective balloon dilatation. Rotational ablation assisted angioplasty may have a role to play in congenital stenotic lesions that are "undilatable".**

(Heart 1998;79:203-204)

Keywords: rotational ablation; children; pulmonary atresia; congenital heart disease

The patient was a 15 month old baby girl who had been born at term following an unremarkable pregnancy. Cyanosis and widespread continuous murmurs were noted in the early days of life and the clinical diagnosis of pulmonary atresia with ventricular septal defect and multiple aortopulmonary collateral arteries (MAPCA) was confirmed echocardiographically. Native central pulmonary arteries were not identified. She grew and developed normally in the early months albeit with gradually worsening cyanosis.

At 8 months old cardiac catheterisation was performed to delineate the pulmonary artery anatomy. She had a confluence of native pulmonary arteries but with severe hypoplasia of the left pulmonary artery. Pulmonary blood flow on the left was sustained via two collateral arteries: an upper collateral communicating with the hypoplastic native left pulmonary artery and a lower collateral with a severe mid-segment stenosis (fig 1). It was thought that if an appropriate diameter of this artery could be achieved then recruitment to the native left pulmonary artery might be technically feasible at a later date.

At 12 months balloon angioplasty was performed using a high pressure non-compliant coronary angioplasty balloon catheter 3 mm in diameter. Even at a balloon inflation pressure of 25 atm for 10-15 seconds the

lesion was resistant to dilatation. Despite the initial appearance of a long segment stenosis there appeared to be a cicatricial-type lesion constricting the balloon catheter (fig 2).

This procedure was well tolerated and without complication but with little if any change in the calibre of the stenotic artery. It was felt that if the cicatricial lesion could be released, more effective balloon dilatation could be achieved. The use of a rotational ablation catheter (Rotablator; Rotablator Heart Technology, Boston Scientific Corporation, Watertown, Massachusetts, USA) appeared to be a logical way to assist the procedure.

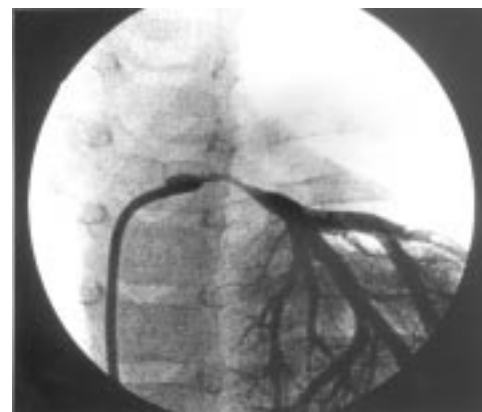


Figure 1 Angiogram of left lower aortopulmonary collateral using a 4 F gauge catheter. Severe mid-segment stenosis is apparent.

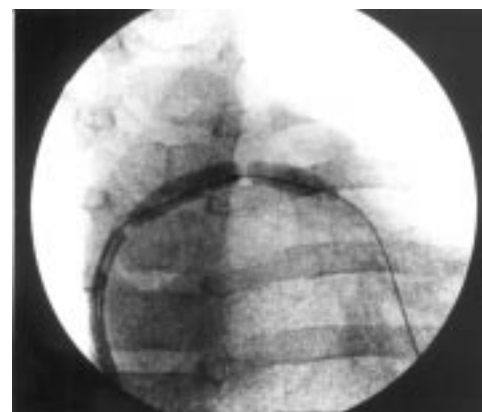


Figure 2 Balloon dilatation of collateral showing rather cicatricial restriction to dilatation in the centre of the balloon angioplasty catheter.

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Accepted for publication  
25 November 1997

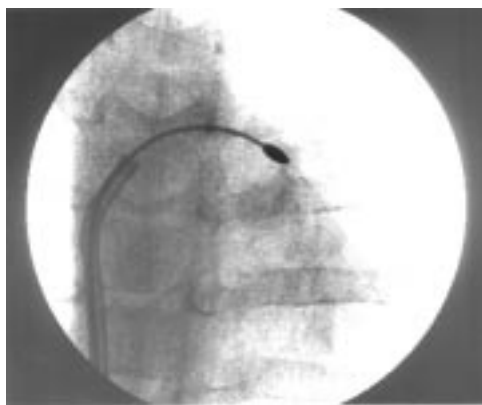


Figure 3 Rotablator in position through 8 F gauge guiding catheter.

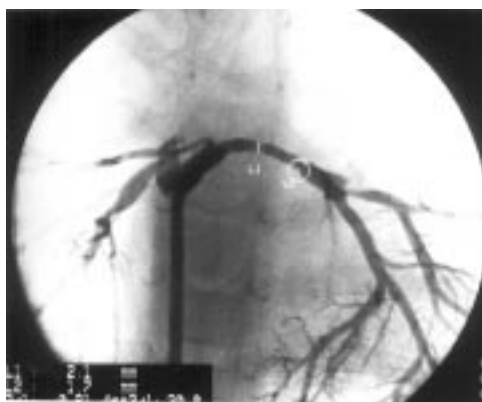


Figure 4 Post-Rotablator and angioplasty angiogram showing improved morphology and diameter of the artery.

Three months later cardiac catheterisation was repeated when 1.5 mm and 1.75 mm diameter Rotablator burrs were used to prepare the collateral (fig 3). The technique used was virtually identical to that for coronary artery angioplasty with the Rotablator supported by a 0.009" wire and an 8 F gauge guiding catheter advanced to the ostium of the aortopulmonary collateral. Heparin (100 U/kg) was given intra-arterially. After rotablation, full dilatation of a 4 mm diameter balloon angioplasty catheter was achieved at 6 atm inflation pressure. Angiography after the balloon dilatation showed an improvement in the morphology and an increase in calibre of the collateral artery from a minimum diameter of 1.1 mm to 1.7 mm (fig 4). The procedure was uncomplicated and the patient was discharged the following morning and prescribed an antiplatelet dose of aspirin. There was a modest improvement in oxygen saturation measured by pulse oximetry from 67% to 74%.

### Discussion

Radical palliation of patients with pulmonary atresia, ventricular septal defect, and MAPCAs is generally done with the intention of increasing pulmonary blood flow using surgically

placed systemic to pulmonary artery shunts and recruitment of the various sources of pulmonary blood flow to a central source, usually native pulmonary arteries. The surgical end point is the restoration of right ventricle to pulmonary continuity and closure of the ventricular septal defect. This is the concept of unifocalisation. The philosophy of unifocalisation is disputed by some, and patients with poor pulmonary artery anatomy may not be considered, with heart lung transplantation the final option.

The poor surgical outlook for this disease has spawned catheter based approaches to palliation, notably balloon angioplasty and stenting of collateral arteries.<sup>1-3</sup> This can undoubtedly improve the oxygenation of selected individual patients. The lesion in this patient was characterised as undilatable as it could not be dilated even at 25 atm, the maximum inflation pressure of currently available high pressure balloon catheters. In theory the restriction that prevents balloon inflation is a fibrous sleeve of tissue that is extremely non-compliant and is unable to be broken by the balloon inflation. The strategy for accomplishing successful dilatation of these lesions using an ablation device to weaken the fibrous tissue seems logical. On this occasion we chose to use a high speed rotational ablation device (Rotablator). The Rotablator functions on the principle of differential ablation—the diamond chips embedded in the surface of the olive shaped burr are more efficient at abrading hard or inelastic tissue than they are soft, compliant tissue. This device has been effective in debulking unfavourable stenotic lesions in the peripheral vascular system of adults primarily characterised by atherosclerosis and calcification.<sup>4,5</sup>

We believe that the successful dilatation of the stenotic lesion in this patient following rotational ablation occurred as a direct result of the Rotablator's ability to interrupt or weaken the restrictive band of fibrous tissue that constrained the balloon angioplasty catheter.

The procedure was done without complication, although theoretically dissection and haemorrhage may occur. This case demonstrates that rotational ablation may improve the results of balloon angioplasty of non-compliant stenotic lesions of aortopulmonary collaterals.

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